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AFPAC



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Chief Malariologist, Hq AFPAC, APO 500

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Observations of Preventive  
Medicine Situation on Okinawa  
from L day to L+60

Filariasis is the most serious hazard to troop health. About 25 per cent of native Okinawans are carrying micro-filaria of a nocturnal variety in their blood streams. The mosquito vector of this disease, Culex quinquefasciatus, is present in large numbers. Five per cent of 650 of these mosquitoes were found to harbor filarial worms. The population of this infected mosquito is increasing in abandoned native villages and will probably be greater as combat areas and towns in the southern end of the island are occupied. It is to be emphasized that the manifestations of filariasis do not develop until 3 to 9 months after exposure. A false sense of security may thus lead to laxity of control measures and result in serious impairment of troop efficiency in the future.

Schistosomiasis is probably of no importance. None of the native Okinawans and only one Japanese have been found to carry eggs of Schistosoma japonicum in about 500 stool examinations. No snails which are known to be hosts of this blood fluke have been found. Examination of more than 1,000 snails from all parts of the island, both by dissection and by the hatching technique, have failed to show any cecariae which are pathogenic for man.

Venereal Disease. The status of venereal infection in the population is still uncertain, as a result of two widely divergent surveys. These surveys revealed 5 per cent positive Kahns in one group of 100 persons and 30 per cent positive Kahns in a second group of similar size. Further surveys are in progress. The discovery of one geisha house with both Japanese and Okinawan Geishas which was doing a boom business and the obvious friendliness of Okinawan women are portents of trouble. Venereal infection in troops is not expected to become an urgent problem until ground combat has ceased and men have time and opportunity for civilian contacts. It will then be a most serious problem unless adequate measures are promptly taken.

Plague. No cases have developed among troops and the disease is said to be rare or absent by Okinawan physicians. The rat population is large and Xenopsylla cheopis is present. Rodent control measures which are being instituted are discussed later in this report and should be adequate.

Snake bites are not a serious problem. Four military personnel have been bitten by snakes during the first 60 days with no fatalities. Mite-borne typhus has not been diagnosed during this period. The mite which carries this disease (Trombicula akamushi) has been identified and the large rodent population is a potential reservoir of this disease. Flea-borne typhus is said to be rare by native physicians although fleas, chiefly Pulex irritans, are present in large numbers in native buildings, on goats and in fields. They are a serious source of discomfort. Body lice (Pediculus corporis) are reported very abundant among the native population and present a hazard of epidemic (louse-borne) typhus.

The absence of diarrhea and dysentery during the first 10 days is largely attributed to the spraying of dead bodies with sodium arsenite solution and to airplane spraying of adult fly populations. The special spray teams which worked behind regimental combat teams, did excellent work. Requisitions of Sodium Arsenite were calculated on basis of  $\frac{1}{2}$  gallon of the dilute solution per body.



TABLE II\*

CONSOLIDATION OF BLOOD SURVYS OF NATIVES  
APRIL AND MAY 1945

	214 MSU	217 MSU	NAMRU # 2	1st MAR DIV E. & M.U.	6th MAR DIV E. & M.U.	GRAND TOTAL	PERCENT POSITIVE
<u>FILARIASIS</u>							
POSITIVE SMEARS	0	44	5	110	57	216	22%
TOTAL SMEARS**	0	400	64	306	199***	969	--
<u>MALARIA</u>							
POSITIVE SMEARS							
P. VIVAX	0	0	0	2	0	2	0.1%
P. FALCIPARUM	0	0	0	0	0	0	--
P. MALARIAE	0	0	0	1	0	1	0.06%
TOTAL SMEARS	405	80	564	175	267	1491	--

TABLE II\*

CONSOLIDATED REPORT ON 231 STOOL EXAMINATIONS ON NATIVES  
MONTH OF APRIL 1945

	1st MAR DIV E. & M.U.	NAMRU #2	M.C. B-6	6th MAR DIV	TOTAL POSITIVE	PERCENT POSITIVE
<u>PROTOZOA</u>						
POSITIVE STOOLS						
E. HISTOLYTICA	8	4	2	0	14	6.0%
E. COLO	7	8	6	00	21	9.9%
E. NANA	1	5	1	1	8	3.5%
IO. BUTCHLII	2	0	1	0	3	1.3%
GIARDIA LAMBLIA	2	3	0	0	5	2.5%
TRICH. HOM.	1	2	0	0	3	1.3%
DIENT. FRAG.	0	0	1	0	1	0.4%
CHILOMASTIX MES.	0	0	1	0	1	0.4%
TOTAL STOOLS	100	81	22	28	56	20.0%
<u>HELMINTH</u>						
POSITIVE STOOLS						
ASCARIS LUMB.	4	28	15	3	50	21.6%
ANCYL. BUGD.	41	28	0	19	88	38.0%
STRONGYLOIDES	2	7	0	0	9	3.9%
TRICH. PRIGH.	0	1	1	1	3	1.3%
ENTEROBUS VERM.	0	1	0	0	1	0.4%
CLONORCHIS SINEN.	0	0	3	0	3	0.3%
SHISTOSOMA JAP.	0	0	0	0	0	--
TOTAL STOOLS	100	81	22	28	154	66.0%

\* INCOMPLETE DATA

\*\* 50 SMEARS TAKEN AT 1400 - ALL WERE NEGATIVE AND ARE OMITTED

\*\*\* SMEARS TAKEN FROM 2100 to 2400

Mosquitoes: Ten species of mosquitoes were distinguished in the 4 weeks prior to 10 May. They are as follows:

<u>Anophelea hyreanus</u>	<u>Culex (Lutzin)</u>
<u>Aedes aegypti</u>	<u>Culex (Cules) mimetacus</u>
<u>Aedes albopictus</u>	<u>Culex (Culex) bitseadorhynabus</u>
<u>Aedes vexans</u>	<u>Culex quinquefasciatus</u>
<u>Armigerea, sp., probably</u>	<u>Culex sp.</u>
<u>Suballatum</u>	

The malaria vector, Anopheles hyreanus sinensia was found to be present in neary all rice paddies examined. Culex quinquefasciatus is by far the commonest mosquito encountered and is reportedly highly effecient vector of filariasis. Aedes aegypti and A. albopictus where not encountered in number but can be expected in some seaports such as Naha and Yonaburu.

Climetological Data (from Marine Corps Weather Control, A.D.C.): During April and early May the minimum temperature was 52.0°F and the maximum temperature was 85.8°F. The mean daily minimum temperature was 63.5°F and the mean daily maximum was 77.6°F. Detailed information as to minimum humidities is not available but daytime relative humidity approximates an average of 60 per cent. Night humidities are much higher.

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## RATS - TWO NEW SPECIES

Specimens sent to museum by Lt. W. L. Howe,  
C.O. of the 31st Malaria Survey Detachment.  
Identified as new species by Dr. R. Kellogg.

In a recent communication to the 31st Malaria Survey Det. by Dr. Remington Kellogg, Curator, Division of Mammals, U.S. National Museum, he asks for more specimens from this island (Mindoro) before final determinations can be made to specimens submitted for identification.

"In the same letter Dr. Kellogg revealed that the two species of rats collected by this unit on Morotai Island, N.E.I., were actually animals entirely new to science. In the 7 May 1945 issue of Vol. 58, Proceedings of the Biological Society of Washington, pp 65-68, Dr. Kellogg described and named these rodents, making our specimens the type series. The series he previously tentatively identified as 'Rattus ringens subsp' (as listed in April report) was found to be an entirely new species which he named Rattus morotaiensis. The other series before considered as Rattus concolor near ephippium has now been given a separate sub-specific standing as Rattus concolor solatus.

## "III A PRELIMINARY REPORT ON MAMMAL PARASITES

"Of forty-three rats of three species collected in various habitats at this base from April 23 to June 1, inclusive, infestation by body-inhabiting tropical rat mites was found on four rats, while 6 rats were hosts to light to heavy infestation of Trombidid or 'Chigger' mites, the latter restricted to the ear lobes. Suitable keys for identification of these mites have not been available thus far. However, Lt. Col. C. B. Philip of the Army Typhus Commission reports that Trombicula deliensis, a suspected vector of scrub typhus in this region, was among the Trombidid mites found in the ear lobes of the large grayish rats, tentatively identified as Rattus mindorensis. A single striped rat of moderate size, Chrotomys whiteheadi, was the only rat infested with lice. A small species of rat of brownish color, very abundant in the foothills but found also on the plains, species unknown as yet, was entirely free of both tropical rat mites and chigger mites. No ticks or fleas were found on any rats. All infested rats of all three species were mature specimens.

"Blood smears were taken on several rats of the two common species with negative results, while a stool specimen of a rat revealed helminth eggs.

"Eggs of two unidentified helminths were found in a stool sample from a wild civet cat kept in captivity."

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## Mosquito Species of Palawan Island, P.I.

as reported by

Capt. C. H. Daniels, Sn C; CO of the 41st MCB.

Immediately after landing and setting up camp, a survey was executed to determine what diseases and what insect vectors were present on the island.

The following mosquitoes were found on the island:

<u>Anopheles barbirostris</u>	<u>Anopheles pseudobarbirostris</u>
<u>Anopheles minimus flavirostris</u>	<u>Anopheles tessellatus</u>
<u>Anopheles subpictus</u>	<u>Culex - 3 species</u>
<u>Anopheles gigus formosus</u>	<u>Uranotainia species</u>
<u>Anopheles hyrcanus</u>	<u>Armigeres species</u>
<u>Anopheles kochi</u>	<u>Megarhinus species</u>
<u>Anopheles vagus limosus</u>	<u>Mansonia species</u>

Blood smears taken from Penal Colonists and civilians both at random and in the hospital revealed the presence in this area of three species of human malaria parasites namely; P. falciparum, P. vivax, and P. malariae. Based on 303 random smears from Penal Colonists and civilians, it was found that a minimum of 16.2% of the local inhabitants were infected with malaria.

An examination of 124 stools revealed the presence among local inhabitants of the following intestinal parasites: Ascaris lumbricoides, Trichuris trichiura, Hookworm, Enterobius vermicularis. Iodamoeba butschlii, Endamoeba histolytica, Endamoeba coli, and Schistosoma japonicum were found among 112 stools from American troops.

From ten scattered localities, 214 snails representing four species were examined for cercariae. No schistosome cercariae were found.

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SECRET

Mosquito Breeding  
Northwestern Negros

The following information has been extracted from a report of the 33rd Malaria Survey Detachment, Captain Charles E. Woodworth, Sn C, Commanding.

"The A. minimus larvae were found in the Lupit River before the first heavy rain in April. Two rechecks since the rain have failed to show any such larvae present. A. barbarostris has been found well up small creeks on three occasions and once in a ditch in the town of Silay. A. vagus limosus is quite common in streams and ditches. The rest of the species are of almost no importance as far as malaria is concerned. Anopheline mosquitoes have been found in grassy banks of streams and road side grass filled ditches ten times each; in foxholes, five times; in fish ponds, three times; in back washes in streams, carabao wallows, pools in rocks above stream level, two times each; and once each in stagnant pools and culverts. It appears from this that the malaria problem is almost nil in the low-land coastal area of northwestern Negros.

"Culicine mosquito breeding is very extensive. Several undesirable species are present and several brackish water breeders cause considerable annoyances. The worst species found was Aedes Aegypti L, the most potent carrier of Dengue Fever, though none of the other Aedes carriers of the disease have as yet been found. Aedes Aegypti was found most frequently in towns particularly in artificial containers, though it was also found in a non-moving drainage ditch and in a carabao wallow. Culex fatigans Wied was found in some kitchen waste water. Other species of culicines are not all checked so will be reported later. Culicine mosquitoes were very frequently associated with Anophelines but correlations are not far enough along to report."

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Results:  
Amoebiasis & Helminthic Survey

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Malaria Studies  
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The work quoted below is from a report of the 40th Malaria Survey Det., Captain Deane P. Furman, Sn C, Commanding.

"On 9 May 1945, a technical report was submitted by this unit reporting an Amoebiasis and Helminthic survey done on 100 Filipinos employed by PCAU in Cebu City. Ninety-three percent of the cases were found infected. Many of these were multiple infections. Endamoeba histolytica was found in 11%, Ascaris lumbricoides in 65%, Trichuris trichiura in 44%, and hookworm in 61% of the cases. The epidemiological implications of this survey are self evident.

"2. On 15 May 1945, this unit completed a technical report of malaria survey for Dumaguete, Negros, Oriental, P.I.

"a. Entomological findings showed that the important Philippine vector of malaria, Anopheles minimus flavirostris was breeding abundantly in streams adjacent to Dumaguete. Anopheles maculatus maculatus, also a vector, was found breeding in moderate numbers. Engorged adult specimens of Anopheles minimus flavirostris were collected from pillboxes in the city area.

"b. A blood smear examination of 150 civilians selected at random showed a malaria incidence of 20%. Plasmodium vivax, flaciparum, and malariae were found in the above order of importance. Cerebral flaciparum malaria has made it's appearance in civilians.

"3. b. Of 100 POW (Japanese) selected at random, 16% were positive for P. vivax infection.

"c. Of 200 civilians from Cebu City selected at random, the total malaria infection was 4.5% (one case of P. falciparum, the P. vivax).

"d. Due to the absence of malaria vectors within one mile of Cebu City (determined from both larval and adult collections of mosquitoes), it is concluded that malaria is not being contracted in the city proper. The continual shifting of the population, both civilian and army, provides ample opportunity for the malaria transmission evidenced in this report."

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SECRET

Airplane Spraying  
Equipment - Method - Results  
by  
Major Virgil C. McMahan, M.C.

1. The subject officer has devoted his time during the months of February and March, 1945, to experimentation with, and the operation of C-47 airplanes equipped for spraying DDT. He has served as technical advisor and supervisor for these planes.

2. Equipment used in Spraying: B-24 bomb bay tanks installed inside C-47 airplanes and connected by metal pipe and rubber tubing to a venturi mounted on the undersurface of the fuselage, slightly anterior to a point midway between the leading and trailing edges of the wings. This venturi is larger but of the same general design as the Hasman-Longcoy model. The DDT solution is delivered to the outlet pipe at the trailing edge of the venturi, by three one (1) inch rubber hoses placed at regular intervals along this pipe. There are 36 apertures with a diameter of 3/8" each as outlets from this pipe. Valves have been installed in the connecting pipes to permit the turning on and off of the spray as desired. One of the four planes has only one tank with a capacity of 330 gals. while the other three have two tanks each with a total capacity of 660 gals. Another tank will be installed in the one plane as quickly as possible. Loading of the planes is accomplished by pumping the DDT solution directly from the drum in which it was mixed into the tanks with an A-6 refueling pump. This requires approximately 40 minutes per plane.

3. Solution Preparation: Thirty pounds of DDT, larvicide, are added to fifty (50) gallons of No. 2 diesel fuel and aggitated by compressed air for a 10 minute period on each of two successive days. The mixture is allowed to stand in the sun for a minimum of 48 hours before using, to allow all the DDT to go into solution. This method gives a 9% solution of DDT in the diesel fuel.

4. Effectiveness:

a. The amount of DDT (0.52 lbs. per acre) applied is slightly in excess of the amount (0.42 lbs. per acre) recommended by Capt. McDuffey as a result of experimental work at Hollandia using an L-5. There is a residual effect for a period of 4 to 6 days within the area sprayed. Smaller concentrations will kill the adult fly and adult mosquito but does not have any residual action.

b. One pool of water in the Subic Bay area yielded 460 anopheline larvae in 50 dips on 10 March. The area was sprayed on 12 March and 6 hours later 50 dips yielded one larva. This pool of water covered an area of approximately 1500 square yards and was without vegetation. Another pool in the immediate vicinity of approximately the same size but covered with a thick mass of algae and water plants about 2 inches high yielded many larvae per dip on 10 March. On 12 March, 6 hours after spraying, there was no appreciable reduction. However, on 13 March, 24 hours after spraying, no larvae were found.

c. One section of a swiftly flowing stream, approximately 30 feet wide, yielding an average of 20 anopheline larvae per dip, was sprayed with a single pass of the plane. Approximately 70% of the larvae were dead within 6 hours from the time of spraying.

d. Reports of studies in two other areas are found in Inclosures 1 and 2.

e. Excellent results in the reduction of flies and adult mosquitoes have been reported from all areas sprayed.

5. Areas Sprayed: The following is a list of areas sprayed with the number of gallons of Diesel fuel and pounds of DDT used.

<u>DATE</u>	<u>AREA</u>	<u>Lbs.</u> <u>DDT</u>	<u>GALLONS</u> <u>Diesel</u> <u>Fuel</u>	<u>AREA</u> <u>(in Sq. mi.)</u>
27 Feb. - 2 March (incl)	Corregidor	1400	2450	3.5
3 - 4 March	San Marcelino Airdrome	200	2100	3
5 March	Ft. Stotsenberg	400	700	1



DATE	AREA	Lbs. DDT	GALLONS DIESEL FUEL	AREA (in Sq. Mi.)
6 March	Argus Area	200	350	0.5
8 - 9 March	Clark Field Area	600	1050	1.5
10 March	Marvelis Harbor Area	200	350	0.5
11 - 12 March	Subic Bay Area	600	1050	1.5
13-14, 18-19 March	Corregidor	1000	1750	3.5
17 - 21 March (Incl.)	Nichols Field and Ft. McKinley Area	7400	13300	20
22 - 23 March	Clark Field Area	1600	2800	4
23 - 24 March	Lingayen Area	1600	2800	4.5
24 March	San Marcelino Airdrome Area	1200	2100	3
25 March	Subic Area	400	700	1
26 March	Ft. Stotsenberg Area	800	1400	2
27 March	San Marcelino Area	200	250	0.5
30 March	Corregidor	1200	2100	3.5
31 March	Floridablanca Area	1200	2100	3.5
	Total	21200	37450	57.0

#### 6. Conclusions:

a. The use of DDT by airplane spraying is a very effective method of mosquito and fly control, especially in new areas prior to the installation of normal field sanitary measures. It is not intended that airplane spraying replace these measures.

b. A concentration of DDT high enough to kill adult flies and mosquitoes and mosquito larvae with a residual effect of 4 - 6 days should give adequate protection to troops for 10 days to two weeks.

c. The C-47 airplane is the most satisfactory for large areas because of its high load capacity and its greater flight range. Smaller planes such as the L-5 should be available for spraying small areas and areas in which the terrain is too rough to permit the use of the less maneuverable C-47.

#### 7. Remarks:

a. Some minor changes in the valve arrangement in three of the planes is required to give optimum results.

b. I wish to express my appreciation for the cooperation given by the 31st and 4th Malaria Survey Units who did all the field studies, and the pilots of the 375th Troop Carrier Group who flew the planes.

As an inclosure to his report, Major MaMahan used the following extract from a report of the 31st Malaria Survey Unit prepared by Lt. Wayne L. Howe, Sn. C.

#### II LOCATION AND DESCRIPTION OF TEST AREAS:

Two test areas were used, swamp A and swamp B.

Swamp A lies approximately 1.5 miles N.E. of Progresso. Its only overflow which is at its southernmost tip runs into a branch of the Amindan River. The swamp is characterized by three arms averaging  $\frac{3}{8}$  mile long and  $\frac{1}{8}$  mile wide which cover valleys formed by low hills and which are joined at their S.E. edges to form a narrow strip of swamp about  $\frac{1}{2}$  mile long. Approximately 70% of the water surface of the long S.E. edge and the W. arm of the swamp is covered exclusively with a dense tangle of matted plant growth which rises no higher than 2 inches above the water surface. The leaves of this plant do not generally lie flat on the water surface and there is abundant space, both shaded and unshaded, for mosquito breeding which averages 2.7 Anophelines and 2 Culicines per dip.

The other 30% of plant coverage in these two areas is tall grasses, cannalilies, and palmetto and pandanus palms. In the W. arm, standing dead trees about 30 to 40 feet high are abundant. The middle and E. arms contain more tall live trees and much less (10 to 20% coverage) low growing matted vegetation than the S.E. edge and W. arm, and an almost impenetrable growth of high thick bladed grasses and young pandanus and palmetto palms. The floor of the last type environment is covered with 6 to 8 inches of water which breeds an average of 2.2 Anophelines per dip. Species of Anophelines identified from swamp A in approximate order of abundance are, A. hyreanus lesteri, A. annularis, A. barbirostris, A. hyrcanus nigerrimus, and A. maculatus.



Swamp B consists of rice paddies 1.5 miles E.N.E. of San Jose, which are partially flooded to an area approximately 300 by 500 feet by a small branch of a stream which runs through San Jose and empties into the Bugsanga River. The area is almost completely overgrown with grass and weeds. There is no overhead cover. Carabao graze in the area and frequent several wallows in which very few mosquitos breed. In a few spots, the water in the flooded part of the paddies flows swiftly enough to support light breeding of A. minimus flavirostris. Species of Anopheline identified in approximate order of abundance are, A. annularis, A. vagus limosus, A. hyrcanus nigerrimus, and A. minimus flavirostris.

### III PROCEDURE:

In swamp A, six days before the spraying, nine larvae sampling stations were staked out in the test area which consisted mainly of the long W.E. edge of the swamp and southern edge of the W. arm. One station was placed 50 ft. inside the E. arm and one in the center of the W. arm. Larva dip counts at each station were taken and recorded.

In swamp B, on the day before the spraying, ten larva sampling stations were staked out in the flooded part of the paddies at points as evenly spaced as possible where larvae were found to be abundant. Dip counts at each station were taken and recorded.

For two nights preceding the spraying, mosquito adult populations were investigated. In swamp A, ten stations were evenly spaced along the  $\frac{1}{2}$  mile S.E. edge. In swamp B, eight stations were evenly spaced along sides of the test area. From 1930 to 2100 hrs, two men in swamp A, and from 1930 to 2030 hrs. two men in swamp B, stopped for five minutes at each station. One man exposed his back from which the other with the aid of a flashlight and chloroform tube collected mosquitos immediately as they alighted.

The spraying was done in the early morning of 22 February. Swamp B was done first. At swamp B at 0730 hrs. the plane made six lengthwise spray flights over the paddies at an approximate average altitude of 70 feet, four of the swaths hitting the test area. There was a light breeze and the approximate average width of the swath of observable droplets was from 125 to 150 feet, thus making almost double coverage of the test area. After the first test swath, the plane was guided by five sets, two to a set, of colored smoke grenades, -- red, yellow, orange, violet, and green. The colors were used since lingering smoke from previous discharges might confuse the pilot. A set of grenades, one grenade at each end of the test area was placed in the desired line of flight and the two were discharged just as the plane turned to make its run over the area.

At swamp A at 0830 hrs. the plane made six spray flights over the swamp. All flights hit the test area at some point, one running almost its entire length. One flight was along the length and in the center of the E arm. The middle arm was sprayed once lengthwise and twice across. One flight crossed the southern part of the E. arm and followed the  $\frac{1}{2}$  mile length of the S.E. edge, and the last flight crossed the N. part of the E. arm. The tall trees in the three arms prevented the plane from spraying at as low an altitude as was desired, but along the S.E. edge the plane flew as low as 100 feet.

From 1930 to 2100 hrs. at swamp A and from 1930 to 2030 hrs. at swamp B on the day of the spraying adult populations were checked. Two days after the spraying, larva checks were made at each swamp.

### IV RESULTS:

SWAMP A									
Larvae						Adults			
Before			After			Before		After	
No. dips	An	Cu	No. dips	An	Cu	Date	2/20	2/21	2/22
60	182	115	75	4	106	No.an.	0	0	0
Ave. Larvae									
per dip		3.0	1.9	0.1	1.4	No.Cu.	69	32	1
Reduction -- 69%*						Reduction -- 98%*			

\* From observation during spraying, it was noted that two larva stations at an extreme corner of the W. arm were missed by spray. If these be discounted in tabulating results, larval reduction would equal 96%.



SECRET

SWAMP B

Larvae						Adults			
Before			After			Before		After	
No. dips	An	Cu	No. dips	An	Cu	Date	2/20	2/21	2/22
50	129	235	60	55	42	No. An.	0	0	0
Ave. larvae per dip									
2.6			4.7			0.9		0.7	
No.			Cu			3		6	
Reduction --			78%*			Reduction --		100%	

\* From observation during spraying, it was noted that two larva stations at an extreme edge of the area were missed by spray. If these be discounted in tabulating results, larval reduction would equal 100%.

V DISCUSSION:

The C-47 is far better adapted to control of large, level areas than to those described in this experiment. China, with its extensive rice paddies would suit it perfectly. In hilly areas containing numerous small swamps, the L5 would be better than the C-47. However, in this experiment good control was accomplished even in areas with a moderate amount of cover. Men in camp sites near swamp A remarked on the fewer adults after spraying.

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Non-commissioned officers in charge of biological observations:

Tech/Sgt Joseph F. Cassel  
Tec/4 Denton W. Crocker

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During the month of April, with the use of four planes, spraying was continued, with Ft. Stotsenberg being sprayed April 1, Laoag, 3 - 4 April; Gavito Naval Base, 5 April; San Marcelino Airdrome, 5 April; Lingayen Gulf Area, 6 April; and Manila, 13 - 16 April. Supplies of DDT were not available for uninterrupted use of the planes

"3. Several changes in the discharge system in the planes have been made with the help of the 81st Malaria Control Detachment and the 100th Air Service Squadron. These changes were necessary in order that a sufficient concentration of DDT could be laid down with one pass of the airplane. Previous to the changes, the discharge rate was 25 gallons per minute in three planes and 35 gallons per minute in the fourth one. The discharge rate after the new installations is 65 gallons per minute. This is slightly in excess of the amount desired but by graduating one valve the quantity discharged is altered to the necessary 60 gallons per minute.

"The system of valves and the rubber tubing previously described... have been discarded. Two inch valves have been installed in each of the pipes connected to the tanks. Two inch pipes extend forward from each valve and join a single 2 inch pipe which runs forward to the door of the cabin and then pierces the floor of the plane to the undersurface. The venturi has not been altered except that a 1½ inch pipe has been installed at the trailing edge instead of the 1 inch pipe. This pipe is connected to the 2 inch pipe by three 1½ inch pipes.

"Each plane is now equipped with two 330 gallon tanks.

"4. Preliminary reports on the spraying of Manila indicate a 95% reduction in adult fly population two days after spraying.

"The adult mosquitoes were reduced approximately 63% and the larval reduction varied, from place to place, from 5% to 95%.

"5. Conclusions:

"a. With the present installation in the planes, better results may be expected in so much as a more even distribution of the DDT can be obtained.

"b. Good results are obtained by the serial dispersion of DDT solution over large cities as well as in the open country."



SECRET

KABAKAN, MINDANAO

Preliminary Report on Snails, Intestinal Helminths and Anopheles Mosquitoes

by

Major Harry J. Bennett, Sn. C.  
CO, 401st Malaria Survey Det.

The Corps Surgeon, X Corps, directed the unit to concentrate on a survey for the intermediate host of Schistosoma japonicum and the survey was begun 3 May. Two Filipinos, native to the area, were employed as guides and have been of great value in directing the personnel of the unit to bodies of water. The terrain in the vicinity of our troops is low and is traversed by many drainage canals and small streams, most of which were dry. However, a very few small streams were flowing and there were some lakes and swamps all of which provided habitats ecologically suitable to snail populations. Nothing was allowed to interfere with the snail survey until 16 May and in the period 3-16 May a large area was covered. The area covered extended from the headwaters of the Kabakan River to Sinawingan, a village thirty five (35) miles west of our base. The area thus surveyed was about fifty (50) miles in length and five (5) in width. Every habitat suitable to snail populations that could be located was thoroughly explored and all the types of snails found were brought to the laboratory for further study. The collection now consists of well over thirty (30) types of snails but a lack of literature has prevented the identification of the species. The only literature on hand entitled "Molluscan Intermediate Hosts of the Asiatic Blood Fluke, Schistosoma japonicum And Species Confused With Them" by Paul Bartsch, describes none of the specimens in the collection. However, three types or species were found which resemble some of the species of Oncomelania to a marked degree. These types have been found in small numbers in one locality and whether or not they might serve as intermediate hosts of S. japonicum is not known.

Several of the genera collected were known as a result of previous experience and it was interesting to note that some of these genera are associated with Oncomelania on Leyte. The known genera are as follows:

Vivipara  
Lymnaea  
Bulinus

Cyraulius  
Brotia  
Plotia

Succinea

The habitats in which some of the above genera were found superficially resemble the habitats in which Oncomelania are found on Leyte but intense search has revealed no species of that genus in such places. Those species found that do have some of the characteristics of Oncomelania were found on the debris covered bottom of shallow streams and drainage ditches in which the water was flowing. It is entirely possible that some of the types similar to oncomelania might serve as intermediate hosts of S. japonicum once the parasite is introduced by infected persons moving to this area.

Following the first progress report to the Corps Surgeon the unit was ordered to enlarge its program and this was done 16 May. The search for snails was continued, the examination of the population for helminthic infestation was begun and a survey of the mosquitoes of the area was initiated.

The results of the examination of one hundred and sixty four (164) individuals for helminths is given in the following table. A single stool specimen was examined in each instance. The helminth eggs were concentrated by washing and sedimentation and it is possible that the infestation percentage for the round worms would have been greater if a floatation technique had been employed also. The majority of those examined were children but the ages ranged from one (1) to seventy two (72) years. Ascaris and hookworm were found in all age groups, the oldest person examined being positive for Ascaris. The two persons, man and wife, found to be positive for S. japonicum were residents of Pangasinan Province, Luzon, prior to their coming here in 1939. It is believed that Fasciolopsis buski is endemic in this area.



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Incidence of Intestinal Helminths in the  
Population of the Kabakan-Sinawingan Area  
of Mindanao - May 1945

Parasite	No. Examined:	No. Positive:	Percent Positive
<u>Ascaris lumbricoides</u>	164	123	75.0
<u>Necator americanus</u>	164	53	32.3
<u>Trichocephalus trichiurus</u>	164	25	15.2
<u>Strongyloides stercoralis</u>	164	2	1.2
<u>Enterobius vermicularis</u>	164	1	0.6
<u>Fasciolopsis buski</u>	164	6	3.6
<u>Schistosoma japonicum</u>	164	2	1.2

During the latter two weeks in May, all territory within a mile radius of Kabakan and the troop concentration on the National Highway near Katidtuan was investigated to determine the amount of anopheline breeding and the various species involved. Roughly, this comprises an area bounded on the north by the wooded, swampy section of Aringay, on the east by the village of Aringay, on the south by a line approximately one kilometer south of the National Highway to the Pulangi River Ferry crossing. This area is a flat river plain of the Kabakan-Pulangi river system and consequently, except for the rivers themselves, typical breeding sites for Anopheles minimus flavirostris are lacking. The intermittent streams, due to a lack of sufficient rain, remain but a series of potholes.

Within the survey area, the Kabakan River was the only body of water discovered to contain Anopheles minimus flavirostris breeding. This is a swift flowing stream with water-eroded banks and A. minimus flavirostris larvae were found only in the occasional grassy spots and in backwaters along the river's edge. In view of the fact that this river is subject to rapid fluctuations affording great flushing action and that A. minimus flavirostris larvae were encountered in small numbers and then only in a few favorable spots, it appears that malaria control operations on this rapidly flowing river are not warranted.

To date six species of Anopheles have been collected and identified. These are:

Anopheles minimus flavirostris  
Anopheles barbirostris  
Anopheles pseudobarbirostris  
Anopheles tessellatus  
Anopheles subpictus indefinitus  
Anopheles philippinensis

The two most common species in this area are Anopheles barbirostris and A. pseudobarbirostris with A. subpictus indefinitus occurring in moderate numbers. Anopheles philippinensis was collected from only one localized breeding site.

Specimens of all larvae collected, both anopheline and culicine, have been preserved. In the laboratory, adults of each species have been reared and in the field biting collections have been made. Systematic work in the laboratory is now in progress with the purpose of obtaining representative anopheline and culicine collection from this region.

\* \* \* ----- \* \* \* ----- \* \* \* ----- \* \* \*

New Arrivals:

Now in the theater are two new units. These are the 178th Malaria Control Detachment under the command of 1st Lt. Harmon S. Bayer, Sn. C. and the 218th Malaria Survey Detachment under the command of Captain Donald J. Pletsch, Sn. C. The name of the other officer with the survey unit is not known at present, but will be published upon the receipt of such information.

\* \* \* ----- \* \* \* ----- \* \* \* ----- \* \* \*



SECRET

Malaria Survey & Mosquito Control  
on Negros Occidental

by

403rd Malaria Survey Detachment  
Major L. D. Christenson, Commanding

Adult Mosquito Surveys: In Bacolod, adult catches at selected stations, including civilian residences and foxholes, were made. The results are tabulated below:

<u>Species</u>	<u>Blooded</u>	<u>Non-blooded</u>	<u>Total</u>	<u>Percent of Total</u>
<u>Anopheles subpictus indefinitus</u>	24	58	82	22.6
<u>A. vagus limosus</u>	13	15	28	7.7
<u>A. litoralis</u>	8	13	21	5.8
<u>Anopheles sp (damaged specimens)</u>	38	33	71	19.5
<u>Aedes aegypti</u>	2	2	4	1.1
<u>Culex quinquefasciatus</u>	28	51	79	21.7
<u>Culex sitiens</u>	40	38	78	21.7
Total	153	210	363	100.1

It will be noted that the efficient vector of filariasis, Culex quinquefasciatus, was present in numbers. There is no evidence of a filariasis problem here, since in 250 blood smears from civilians examined thus far, no Wuchereria bancrofti have been found.

Results of an adult catch made in a covered foxhole by spreading a white sheet on its floor and then killing the mosquitoes with aerosol spray show the degree of which foxholes may be used as daytime resting places of mosquitoes. These are tabulated below:

<u>Species</u>	<u>Blooded</u>	<u>Non-blooded</u>	<u>Total</u>	<u>Percent of Total</u>
<u>Anopheles subpictus indefinitus</u>	18	57	75	33.8
<u>A. vagus limosus</u>	10	14	24	10.8
<u>A. litoralis</u>	8	11	19	8.6
<u>Anopheles sp (damaged specimens)</u>	38	33	71	32.0
<u>Aedes aegypti</u>	0	0	0	0.0
<u>Culex quinquefasciatus</u>	1	6	7	3.1
<u>Culex sitiens</u>	8	18	26	11.7
Total	83	139	222	100.0

Malaria Surveys: During the month of May, two blood surveys for malaria parasites were conducted in the towns of Talisay and Silay. Of the fifty blood smears taken on children in a five to ten year age group in Talisay, negative results were obtained. However, two of the children were found to have enlarged spleens, possibly indicating previous infections. Fifty blood smears were taken in Silay on children in the same age group. Results obtained showed a 6.0% enlarged spleen rate. It is interesting to note that all children with enlarged spleens at Silay had malaria parasites present in the peripheral blood. Information obtained from interrogating the three infected children in Silay showed that all had been residing in the hills for the past seven months. Slide service by this unit was made available to both clearing companies of the 115th Medical Bn. and to date 56 blood smears have been diagnosed. Of these nine were positive for P. vivax and two contained gametocytes of P. falciparum.

Status of Mosquito Control: Indications are that effective oiling of large areas, stream channeling and ditching operations of the 34th Malaria Control Detachment, and troop mosquito squads have maintained population levels of ground pool and stream breeding mosquitoes at approximately their dry season levels in coastal troop bivouac areas. This is a commendable showing in view of the recent great expansion of total water surface, and the large control area involved. A measurable increase in Aedes aegypti breeding in May was noted. This is currently the most important mosquito control problem confronting troops bivouaced in cities and towns, and requires detailed attention for successful solution. The recent organization of troop unit control teams to conduct a city wide campaign against Aedes aegypti and pest mosquitoes in Silay is a highly desirable expediency which should be in other population centers. Greater participation in



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mosquito control by troop unit mosquito squads in suggested by reports of survey inspections. The success of periodic airplane application of DDT in kerosene for mosquito control in cities on other bases provides the best answer to our problems. By this means, both larvae and adults are killed. Furthermore, the effect on flies should be considerable. The 403rd Malaria Survey Detachment continued to work in close cooperation with the 34th Malaria Control Detachment, providing results of surveys informally from day to day for corrective action.

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### PARASITOLOGY - SPECIAL REPORT

by

Captain W. J. Spicer, Sn C  
205th Malaria Survey Det

A total of 389 U. S. troops from four different groups were examined for intestinal parasites. Fifty seven (14.7%) were found to be infected with some pathogenic parasites.

TABLE I. Number Parasitized by Units.

	Number Examined	Number Parasitized	Per cent
Division Service Units	103	11	10.7%
Infantry Regiment	100	24	24.0
Engineer Boat and Shore Regt.	97	11	11.3
Field Artillery Units	89	11	12.4

TABLE II. Parasites Found.

<u>Hookworm</u>	39
<u>Ascaris</u>	5
<u>Trichuris</u>	9
<u>Strongyloides</u>	3
<u>Endamoeba histolytica</u>	6
<u>Endamoeba coli</u>	27
<u>Endolimax nana</u>	6
<u>Trichomonas hominis</u>	1
<u>Enteromonas</u>	3
<u>Isospora hominis</u>	1

\* \* \* ----- \* \* \* ----- \* \* \* ----- \* \* \*

During the month the following communication was received from Major Thomas A. Hart, Sn C.

"Since rotation came my way I have left the 6th Malaria Survey Unit, returned to the States, and am assigned to the SGO in Washington, D. C. This new assignment is in the Malaria Control Branch of the Tropical Disease Control Division, SGO. I am still very much interested in all phases of malaria work. If I can be of service to anyone of you on technical matters, in securing literature, or in anyway help you further the cause, I shall be happy to do so. Please let me hear from you. Kind regards and good luck to you all."

\* \* \* ----- \* \* \* ----- \* \* \* ----- \* \* \*

Last months issue of this paper contained an article entitled "Four Schistosomiasis Cases on Luzon". However, a later laboratory diagnosis has shown that the preliminary diagnosis was incorrect. Therefore, to our knowledge, there have been no cases of schistosomiasis contacted on Luzon.

\* \* \* ----- \* \* \* ----- \* \* \* ----- \* \* \*



SECRET  
A Survey of  
Formosan Prisoners for Intestinal Parasites  
by

Lt. Robert B. Darrows, Sn. C.  
30th Malaria Survey Detachment

1. During the latter part of March and the first part of April a survey of intestinal parasites harbored by Formosans in the P.O.W. Camp, near Dugupan, was made. The object was to determine the kinds and incidences of parasites in these people, thus giving us in advance an idea of the infections our troops will encounter, if Formosa is invaded.

2. Movement orders were received before the project was completed, but a total of 244 out of approximately 300 were examined. The collection of stool specimens was entrusted to one of the prisoners who spoke English and he wrote the names on the specimen cups. Only five (2.0%) of the prisoners examined failed to show any infections. The average number of species per prisoner was 2.52, which is the highest incidence the writer has found among any race he has examined.

3. The incidences found among these prisoners areas follows:

PROTOZOA		WORMS	
Endamoeba coli	26.6	Hookworm	81.9
Endamoeba histolytica	10.2	Ascaris	50.4
Endolimax	11.9	Trichuris	63.1
Chilomastix	2.0	Strongyloides	.4
Trichomonas	2.0	Echinostoma (?)	.8
Giardia	.8		

4. Two prisoners had ova in their stools which resembled those of Echinostoma. As one species of Echinostoma, a fluke, is fairly common in Formosa, the writer asked the Medical Officer at the Camp to treat these two prisoners, so that the adult flukes could be obtained for identification. The administration of the salts and drug was entrusted to a Japanese doctor in the camp. Apparently he did not follow instructions, as no loose stools were passed and no worms of any sort found, even though both prisoners had hookworm and one had Trichuris in addition. Arrangements were then made to repeat the treatment, but the unit received orders and moved to another base before this could be accomplished.

5. From these examinations it is possible to conclude that our troops will encounter very heavy intestinal infections if Formosa is invaded.

\* \* \* ----- \* \* \* ----- \* \* \* ----- \* \* \*

Sanitation: Nergoes to Panay

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An Experience of the  
33rd Malaria Survey Detachment

In the area of Negros where this unit was surveying conditions were rapidly being cleaned up. There were still many mosquitoes though the breeding areas were markedly reduced. In Panay, however, conditions were very bad. In the city of Iloilo, in the downtown area, there were 212 uncovered latrines which were filled with maggots. Feces were found scattered promiscuously in nine open field areas. Decomposing trash and garbage was present in twenty-one areas. In La Paz there were 49 open, magotty latrines, two areas of feces in the open field, 3 cases of decaying garbage and kitchen waste, and one ditch partially filled with decaying garbage. In Jaro there were 32 open latrines and in Molo there were 55. The markets at Iloilo, La Paz and Jaro are in terrible sanitary condition, with unimaginable toilet facilities, with garbage un-removed. In almost all parts of the city the yards were littered with trash and garbage as no adequate method of garbage disposal has been re-established. With the partial destruction of the water system and the almost total destruction of homes with sanitary facilities, the disposal of human waste presents a deplorable condition. A program has been started to give the civilians a knowledge of what they can do. Fifteen one-hour lectures to a total of 2500 high school students have been made. The school is establishing a follow up inspection. The City Council is to call area meetings to spread direct word of the program to all parts of the city. The public markets are being cleaned and inspectors placed at the Iloilo and La Paz markets.

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6 June 1945

SPECIAL LISTS OF EQUIPMENT  
FOR MALARIA CONTROL DETACHMENT (FA)

ENGINEER

1			3
Item	Reduction	Addition	Basis of Distribution & Remarks
Sketching Equipment, Set No. 1	ea.	1	
MEDICAL			
Kit, first-aid, motor vehicle, 12-unit, complete	ea.	6	
QUARTERMASTER			
Basin, wash	ea.	3	1 per 5 indiv.
Bucket, general-purpose galvanized, heavy-weight, without-lip, 14-quart capacity	ea.	2	
Bucket, canvas water, 18-quart	ea.	4	
Container, food, insulated, M-1944	ea.	2	
Desk, field (empty), fiber, Company	ea.	1	
Hammer, carpenters' curved-claw, bell-faced, weight 1 lb.	ea.	1	
Hatchet, claw, width of cutting edge 4 inch	ea.	1	
Lantern, gasoline, leaded fuel	ea.	2	
Lantern, Kerosene, army	ea.	4	
Lock, pad, brass, 2-inch	ea.	2	
Machine, paper-fastening lever-or-plunger type, wire-staple, performed, light duty	ea.	1	
Mattock, pick, with-handel, weight 5 lb.	ea.	1	
Perforators, non-adjustable, 2-hole	ea.	1	
Pick, handled, railroad, 6-to-7 lbs.	ea.	1	
Pump, barrel, rotary kerosene-or-gasoline, with 6-ft. hose-and nozzle	ea.	1	
Pump, oil-barrel, motor-oil-dispensing, 1-quart, 15-to-60-gallon, barrel-or-drums	ea.	1	
Sharpener, pencil, office, transparent	ea.	1	
Shovel, general purpose, long-handled, strap back, round point No. 2	ea.	5	
Sledge, blacksmiths' double-faced, weight 8-lb.	ea.	1	
Sprayer, liquid, insecticide, continuous-spray, 2 quart	ea.	3	
Stencil, outfit, complete, w/figures-and-letters $\frac{1}{2}$ inch and 1-inch.	ea.	1	
Typewriter, portable, with-carrying-case	ea.	1	
Whistle, thunderer	ea.	1	

A CERTIFIED TRUE COPY:

*G. L. Orth*

G. L. ORTH  
Colonel, M.C.



SECRET

6 June 1945

SPECIAL LISTS OF EQUIPMENT

FOR MALARIA SURVEY DETACHMENT (FB)

T/O&E 8-500, Medical Service Organization, dated 18 January 1945, with Ch 1, 27 March 1945, Column FB, Malaria Survey Detachment, is amended as follows:

ENGINEER

1	2	3
Item	Reduction- Addition	Basis of Distribution and Remarks
Compass, lonsatic, luminous dial type, w/case	ea	2
Sketching equipment, Set No. 1		1
MEDICAL		
Kit, first-aid, motor vehicle, 12-unit, complete	ea	3
ORDNANCE		
Truck $\frac{1}{2}$ -ton 4 x 4	ea	1
QUARTERMASTER		
Bag, delousing	ea	1
Basin, wash	ea	3 1 per 5 indiv
Bucket, general purpose galvanized, heavy-weight without-lip, 14 quart capacity	ea	2
Bucket, canvas water, 18 quart	ea	2
Can, corrugated, nesting galvanized, with-cover-32 gallon	ea	1
Container, food, insulated M-1944	ea	2
Desk, field (empty), fiber Company	ea	1
Hammer, carpenters', curved claw, bell-faced, weight 1-lb	ea	1
Hatchet, claw, width of cutting edge 4-inch	ea	1
Lantern, gasoline, leaded fuel	ea	3
Lantern, kerosene, army	ea	2
Lock, pad, brass, 2-inch	ea	2
Machine, paper-fastening lever-or-lunger type, wire-staple, preformed light-duty	ea	1
Mattock, pick, with-handle weight 5-lb	ea	1
Perforators, non-adjustable, 2-hole	ea	1
Pick-handled, railroad, 6-to-7 lbs	ea	1
Pump, barrel, rotary, kerosene-or-gasoline, with 6-ft. hose-and-nozzle	ea	1 1 per 50 indiv



QUARTERMASTER

1		2	3
Item		Reduction-Addition	Basis of Distribution and Remarks
Pump, oil-barrel, motor-oil-dispensing, 1-quart, 15-to-60-gallon, barrel-or-drums	ea	1	
Shovel, general purpose, long-handled, strap back, round point No. 2	ea	1	
Sledge, blacksmiths', double-faced, weight 8-lb	ea	1	
Sprayer, liquid, insecticide continuous-spray, 2-quart	ea	3	
Stencil outfit, complete, w/figures-and-letters $\frac{1}{8}$ -inch and 1-inch	ea	1	
Tube, flexible, nozzle	ea	1	1 per vehicle
Typewriter, portable, with-carrying case	ea	1	
Whistle, thunderer	ea	2	

CERTIFIED TRUE COPY:

*G. L. Orth*

G. L. ORTH  
Colonel, Medical Corps  
Chief Malarialogist